

Remarks

Reconsideration of this Application is respectfully requested.

Status of the Application and Claims

Upon entry of the foregoing amendments, claims 1-19, 27, and 35-49 are pending in the application, with claims 1, 9, 10, 11, 35, 36, 41, 42, 43, 44, and 47 being the independent claims. Claims 20-26 and 28-34 previously were cancelled. Claims 9, 10, 19, 27, and 35 previously were withdrawn from consideration in the present application pursuant to a restriction/election of species requirement. Claims 1, 11, 36, and 41-44 are amended herein. Claims 45, 46, 47, 48, and 49 are newly presented herein.

Summary of the Office Action

In the Office Action, claims 1-7, 11-17, and 36-44 were rejected under 35 U.S.C. § 103(a), as allegedly being unpatentable over D. Billsus, M.J. Pazzani, "Learning collaborative information filters," Proc. Fifteenth International Conference, 1998, (hereafter "*Billsus*") in view of "Official Notice" ("that using collaborative filtering techniques such as taught by Billsus can be used to receive requests and provide output"), and claims 8 and 18 were rejected under 35 U.S.C. § 103(a), as allegedly being unpatentable over *Billsus* and *Official Notice*, further in view of J. Schwinger, "The Geometry of Quantum States", Proceedings of the National Academy of Sciences of the United States of America, February 15, 1960 (hereafter "*Schwinger*").

Reconsideration and withdrawal of the rejections respectfully are requested in view of the above amendments and the following remarks.

Summary of Examiner Interview

Applicants attorneys gratefully acknowledge the courtesies extended to them by the Examiner in granting a telephone interview on December 23, 2009. In that interview, Applicants' attorneys discussed various features of the claimed invention, including the features of *forming ... a plurality of data structures representing said sparse unary ratings matrix, wherein the plurality of data structures includes a matrix of co-rates*, and presented arguments distinguishing the claims over the cited references. No agreement was reached as to patentable subject matter. However, the Examiner tentatively agreed that *Billsus* does not explicitly disclose the feature of a matrix of co-rates, wherein the matrix of co-rates includes either a pre-multiplication of the sparse unary ratings matrix by a transpose of the sparse unary ratings matrix or a post-multiplication of the sparse unary ratings matrix by the transpose of the sparse unary ratings matrix. The Examiner agreed to further consider Applicants' arguments upon the filing of a written reply to the Office Action.

Rejections under 35 U.S.C. § 103

Claims 1-7, 11-17 and 36-44

The rejection of claims 1-7, 11-17 and 36-44 under 35 U.S.C. § 103(a), as allegedly being unpatentable over *Billsus* in view of *Official Notice*, respectfully is traversed. Nevertheless, without conceding the propriety of the rejection, claims 1, 11, 36 and 41-44 have been amended herein more clearly to recite various features of the claimed subject matter, and newly presented claims 45, 46, 47, 48, and 49 have been added herein to provide Applicants with additional scope of protection commensurate with the disclosure. Support for the amendments may be found throughout the original

application, e.g., at pages 9-11 (see discussion below) and 16-17. No new matter has been added.

Applicants submit that there are differences between the subject matter sought to be patented and the prior art, such that the subject matter taken as a whole would not have been obvious to one of ordinary skill in the art at the time the invention was made. 35 U.S.C. § 103. Specifically, Applicants submit that *Billsus* fails to teach or suggest each and every element of the claims.

Independent claim 1 recites (emphasis added):

A method of preparing a user recommendation comprising:

generating, in memory, a sparse unary ratings matrix from users' selected preferences, wherein each user's selected preferences are represented as unary data entries in said sparse unary ratings matrix, wherein each unary data entry has a value of either zero or one;

forming in at least one data processing device a plurality of data structures representing said sparse unary ratings matrix, wherein the plurality of data structures includes a matrix of co-rates, and wherein the matrix of co-rates includes either a pre-multiplication of the sparse unary ratings matrix by a transpose of the sparse unary ratings matrix or a post-multiplication of the sparse unary ratings matrix by the transpose of the sparse unary ratings matrix;

forming in the at least one data processing device a runtime recommendation model from said plurality of data structures;

determining in the at least one data processing device a recommendation from said runtime recommendation model in response to a request for a recommendation; and

providing said recommendation in response to said request.

Independent claims 11, 36, 41-44, and 47 similarly recite a combination of features including *forming ... a plurality of data structures representing said sparse unary ratings matrix, wherein the plurality of data structures includes a matrix of co-rates, and wherein the matrix of co-rates includes either a pre-multiplication of the*

sparse unary ratings matrix by a transpose of the sparse unary ratings matrix or a post-multiplication of the sparse unary ratings matrix by the transpose of the sparse unary ratings matrix.

The present application, at pages 10-11, explains the features of a ratings matrix **R** and a matrix of co-rates **M**, as follows (emphasis added):

As used herein, a *ratings matrix* is a collection of numerical values indicating a relationship between a plurality of clients and a plurality of items. In general, and as indicated earlier, one may denote this as:

$$\mathbf{R} = \mathbf{R}_{u,i} = \begin{array}{l} 1 : \text{if client } u \text{ votes favorably for item } i \\ 0 : \text{otherwise.} \end{array}$$

...

As used herein, an *item-item model* may be constructed by computing the matrix ${}_{(I-I)}\mathbf{M} = \mathbf{R}^t\mathbf{R}$ where the superscript "*t*" indicates a transposed matrix, and the pre-subscript "(I-I)" on **M** indicates an *item-item model*. The *item-item* model indicates the correlation between the two items for which preference ratings are known. The diagonal portion of ${}_{(I-I)}\mathbf{M}$, for example the entry at row *i* and column *i*, corresponds to the total number of votes for item *i*. Furthermore, the number of clients having co-rated any item-item pair is given by the respective entries from the matrix **R**^t**R**.

...

Further still, given any two clients, the number of co-rated items between them is given by the respective entry of **RR**^t. Both symmetric forms are of interest to the types of problems that will be discussed herein."

Applicants submit that the cited references, alone or in any combination, fail to disclose or suggest at least the above-recited feature of the claims.

Billsus relates to learning collaborative information filters and to predicting items a user would like on the basis of other users' ratings for these items, and purports to propose a representation for collaborative filtering tasks that allows the application of virtually any machine learning algorithm, and to disclose an algorithm based on the singular value decomposition of an initial matrix of user ratings, exploiting latent

structure that essentially eliminates the need for users to rate common items in order to become predictors for one another's preferences. *See, Abstract.* In particular, *Billsus* discloses a first preprocessing step to remove features that appear less than twice in the training data. *See Page 3, Col. 1.* The result of this preprocessing step is a matrix *A* that contains zeros and ones, with at least two ones in every row. *Id.* Following the preprocessing step, the singular value decomposition (SVD) approach is applied to decompose matrix *A* into the product of three matrices: $A = U\Sigma V^T$, where the columns of *U* and *V* are orthonormal vectors that define the left and right singular vectors of *A*, and Σ is a diagonal matrix containing corresponding singular values. *Id.*

However, nowhere does *Billsus* disclose or suggest at least the feature of *forming ... a plurality of data structures representing said sparse unary ratings matrix, wherein the plurality of data structures includes a matrix of co-rates, and wherein the matrix of co-rates includes either a pre-multiplication of the sparse unary ratings matrix by a transpose of the sparse unary ratings matrix or a post-multiplication of the sparse unary ratings matrix by the transpose of the sparse unary ratings matrix*, as disclosed in the present application and variously recited in independent claims 1, 11, 36, and 41-44.

Assuming *arguendo* that the Examiner's asserted *Official Notice* is proper (which Applicants do not concede), Applicants submit that the asserted *Official Notice* does not remedy the above deficiencies of *Billsus*. In the Office Action, the Examiner takes *Official Notice* "that using collaborative filtering techniques such a [sic] taught by *Billsus* can be used to receive requests and provide output." *Office Action*, p. 5. However, the asserted *Official Notice* does not suggest at least the feature of *forming ... a plurality of data structures representing said sparse unary ratings matrix, and wherein the matrix of*

co-rates includes either a pre-multiplication of the sparse unary ratings matrix by a transpose of the sparse unary ratings matrix or a post-multiplication of the sparse unary ratings matrix by the transpose of the sparse unary ratings matrix, as disclosed in the present application and recited in the claims. Nor does the asserted *Official Notice* add anything to *Billsus* that would have made obvious the claimed features.

For the above reasons, independent claims 1, 11, 36, and 41-44 are allowable over the cited *Billsus* and *Official Notice*.

Dependent claims 2-7, 12-17, and 37-40 depend from claims 1, 11, 36, and 41-44, respectively, and are patentable for at least the same reasons. Moreover, each of these dependent claims recites further features in combination with the features of its respective base claim and is believe allowable in its own right. Individual consideration of the dependent claims respectfully is requested.

Claims 8 and 18

The rejection of claims 8 and 18 under 35 U.S.C. § 103(a), as allegedly being unpatentable over *Billsus* and *Official Notice*, further in view of *Schwinger*, respectfully is traversed.

Claims 8 and 18 depend from claims 1 and 11, respectively, and are allowable for the same reasons. Moreover, each of these dependent claims recites further features in combination with the features of its respective base claim and is believe allowable in its own right. Individual consideration of the dependent claims respectfully is requested.

In this regard, assuming *arguendo* that *Billsus*, *Official Notice* and *Schwinger* may be combined in the manner asserted by the Examiner (which Applicants do not

concede), *Schwinger* fails to remedy the above-discussed deficiencies of the *Billsus* reference and *Official Notice*.

The *Schwinger* publication is cited merely for its alleged disclosure of multiplying matrices by a mapping matrix in order to map the matrices to that matrix. Without conceding the propriety of the Examiner's characterization of the *Schwinger* publication, Applicants submit that the *Schwinger* publication fails to disclose or suggest at least the above-discussed features of *forming ... a plurality of data structures representing said sparse unary ratings matrix, wherein the plurality of data structures includes a matrix of co-rates, and wherein the matrix of co-rates includes either a pre-multiplication of the sparse unary ratings matrix by a transpose of the sparse unary ratings matrix or a post-multiplication of the sparse unary ratings matrix by the transpose of the sparse unary ratings matrix*, as disclosed in the present application and variously recited in the claims. Nor does *Schwinger* add anything to *Billsus* and/or *Official Notice* that would have made obvious at least these claimed features.

For at least the above reasons, claims 8 and 11 are allowable over the cited references and *Official Notice*.

Conclusion

Applicants believe that the present Amendment is responsive to each of the points raised by the Examiner in the Office Action and the telephone interview, and submit that the application is in condition for allowance. Favorable consideration of the claims and passage to issue of the application at the Examiner's earliest convenience earnestly are solicited.

If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Respectfully submitted,

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